TEL-2 commissioning

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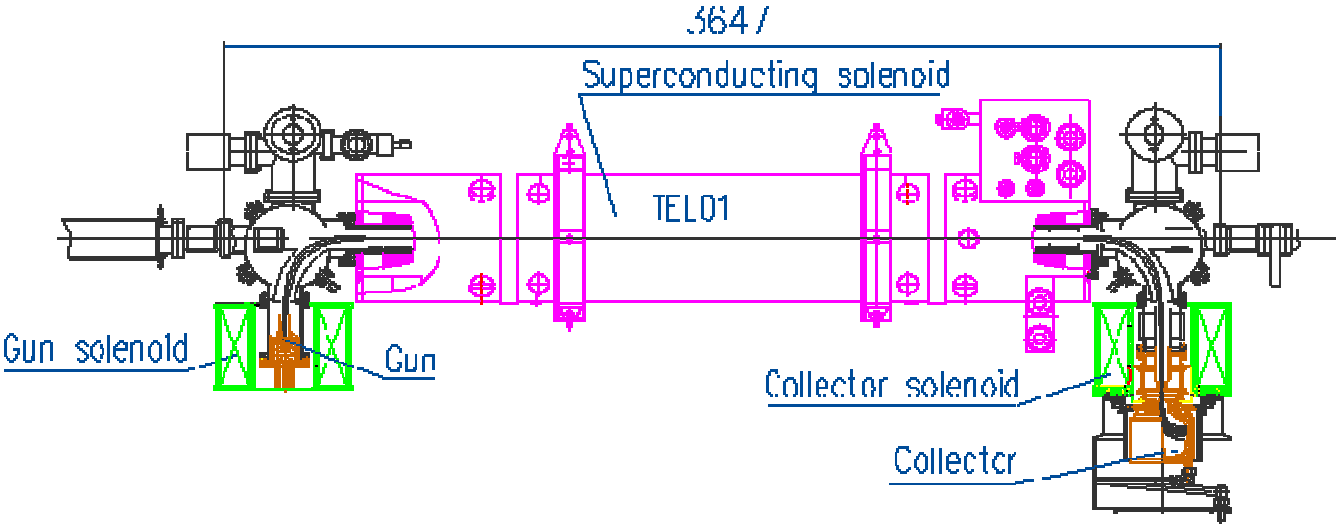
All Experimenters' Meeting – August 28, 2006

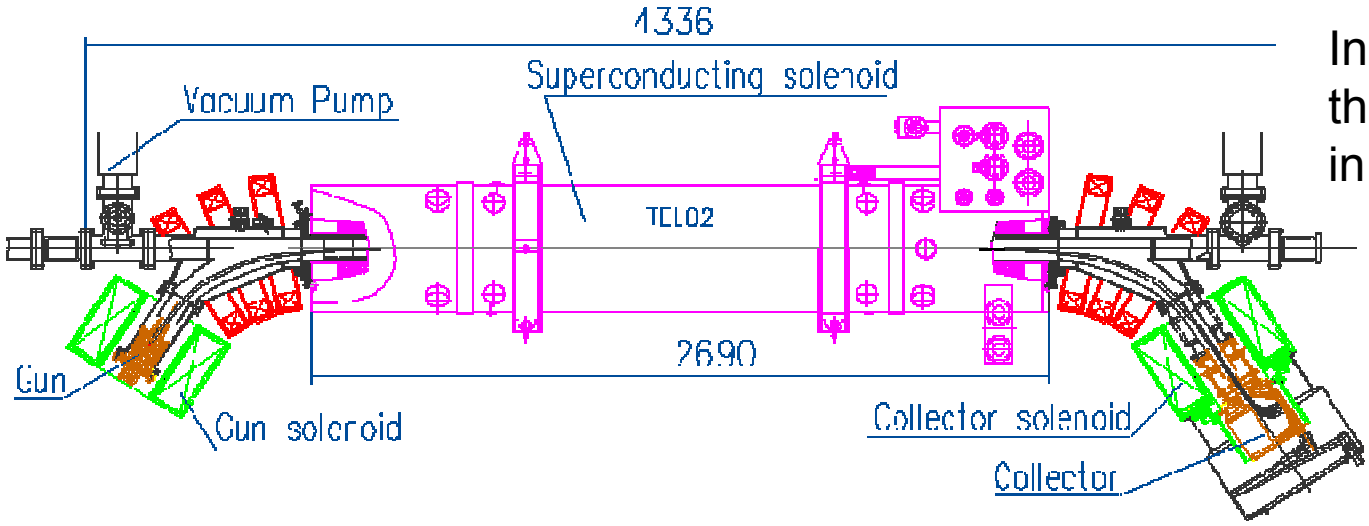
TEL2 and TEL1 what's different

TEL1



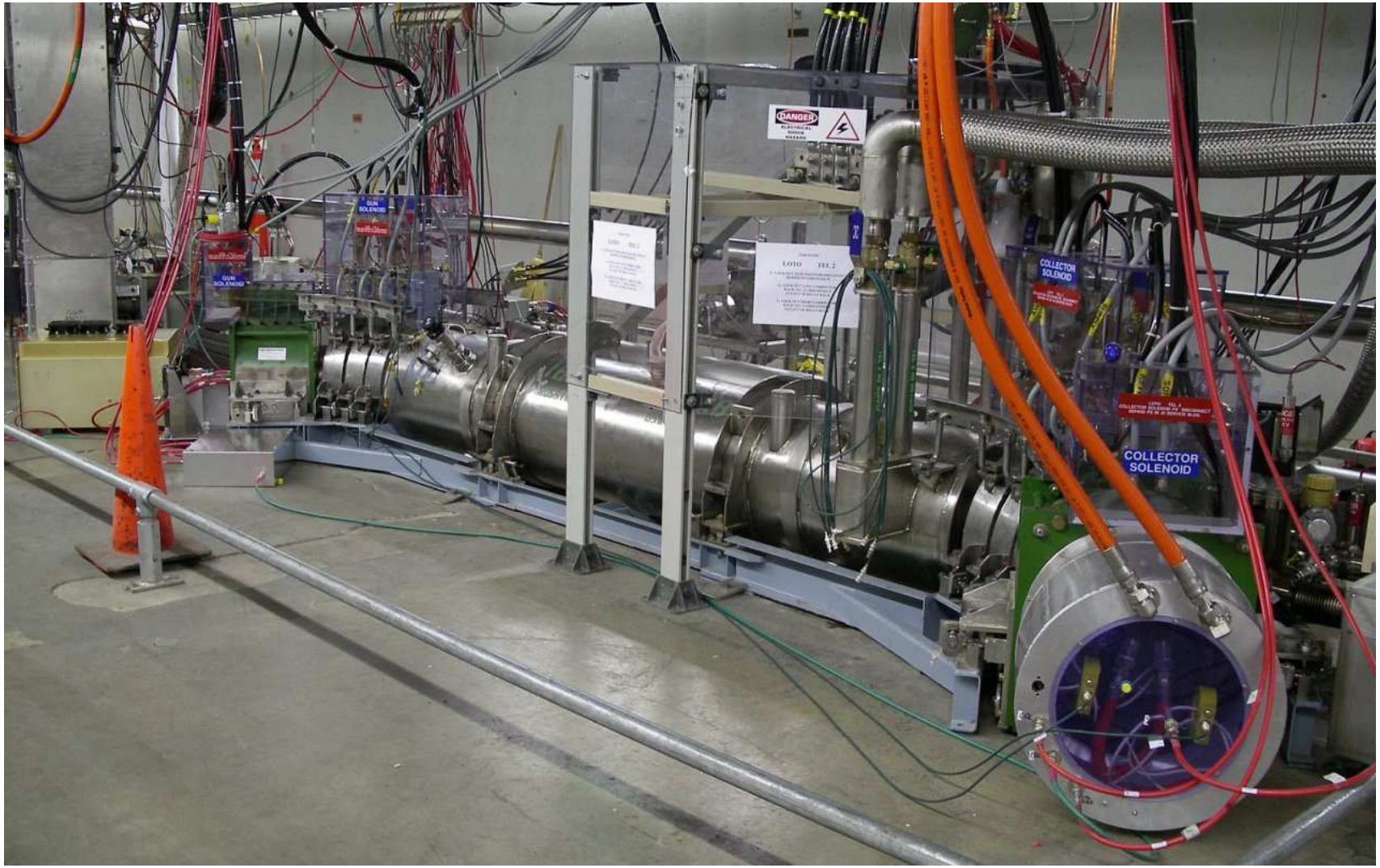
Installed in the Tevatron in 2001

TEL2



Installed in the Tevatron in 2006

TEL2 installed in the Tevatron



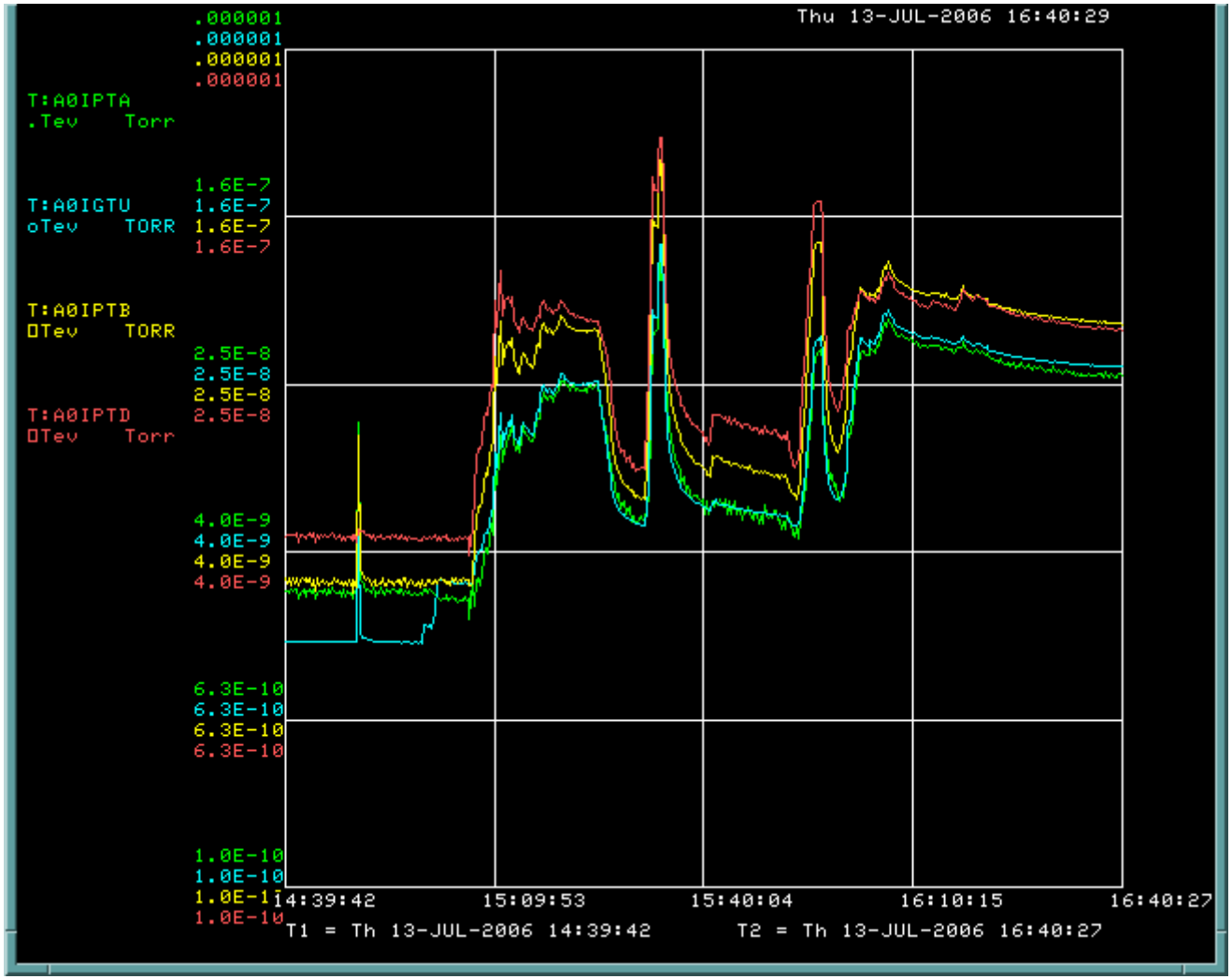
TEL 2 parameters

- Smaller bending angle
- Additional magnets in the bends
  - Higher magnetic field in the bends
  - great flexibility in magnetic field settings B_{gun}/B_{main}
  - easy adjustment of size and current density of electron beam
- Improved diagnostics
- Installed at A11 (large $ß_v$ and small $ß_x$), → vertical tune shifts

HV pulser/modulator

- Initial plan was to use the newly designed Marx generator (MG) to pulse the e-gun.
- MG (solid state) failed after couple weeks of Tev operation and was found activated
- MG was replaced by a spare RF tube based modulator, water cooled.
  - Flow meters (turbines) problem fixed, one turbine has been replaced, the second one is to be replaced.
- Collector conditioning was done using dc e-beam
- In a month MG was found not radioactive and working again.
- Modifications to MG: remote on/off control added, copper bus replaced by aluminum.

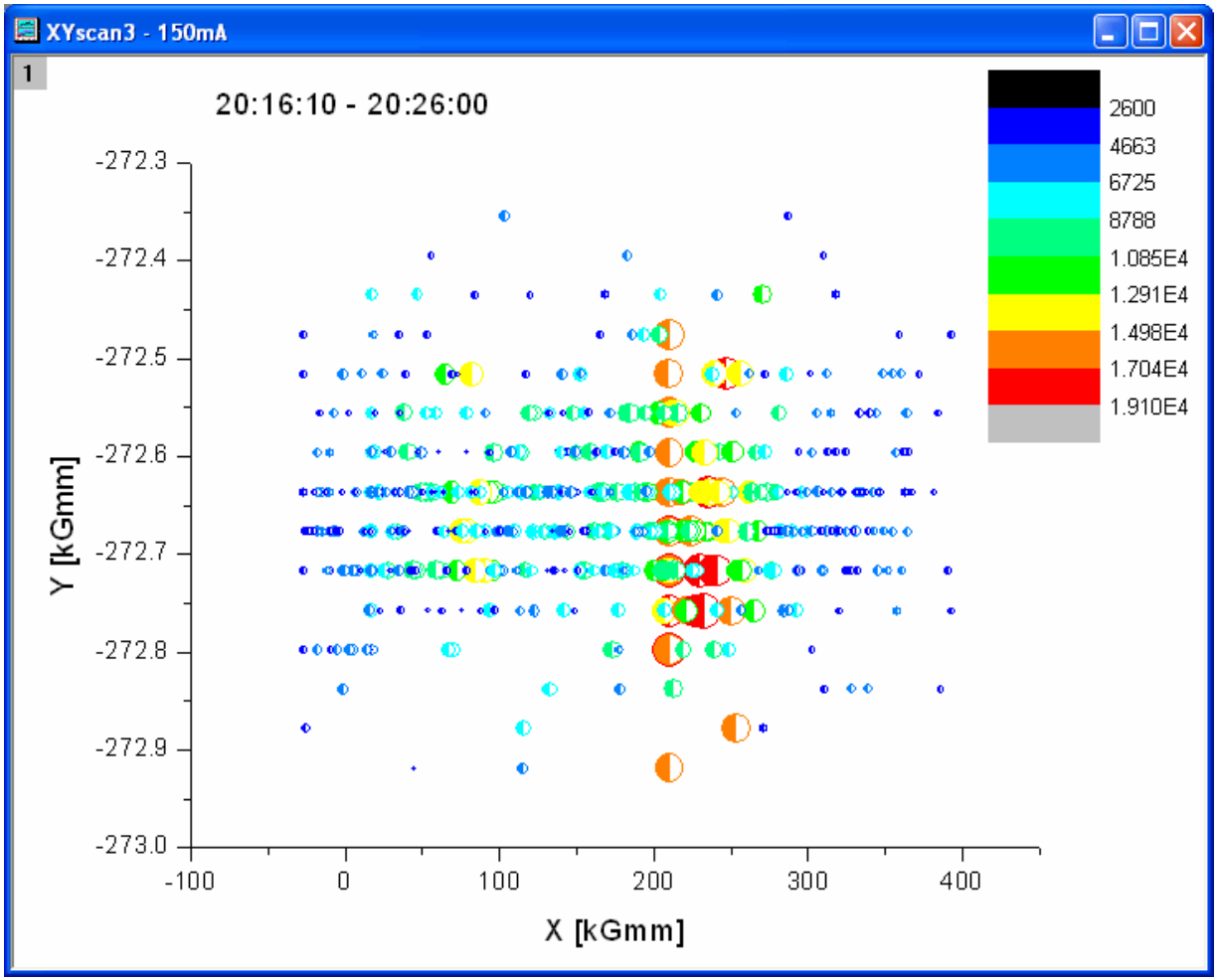
Collector conditioning



TEL2 vacuum after about 3x3 hours of conditioning

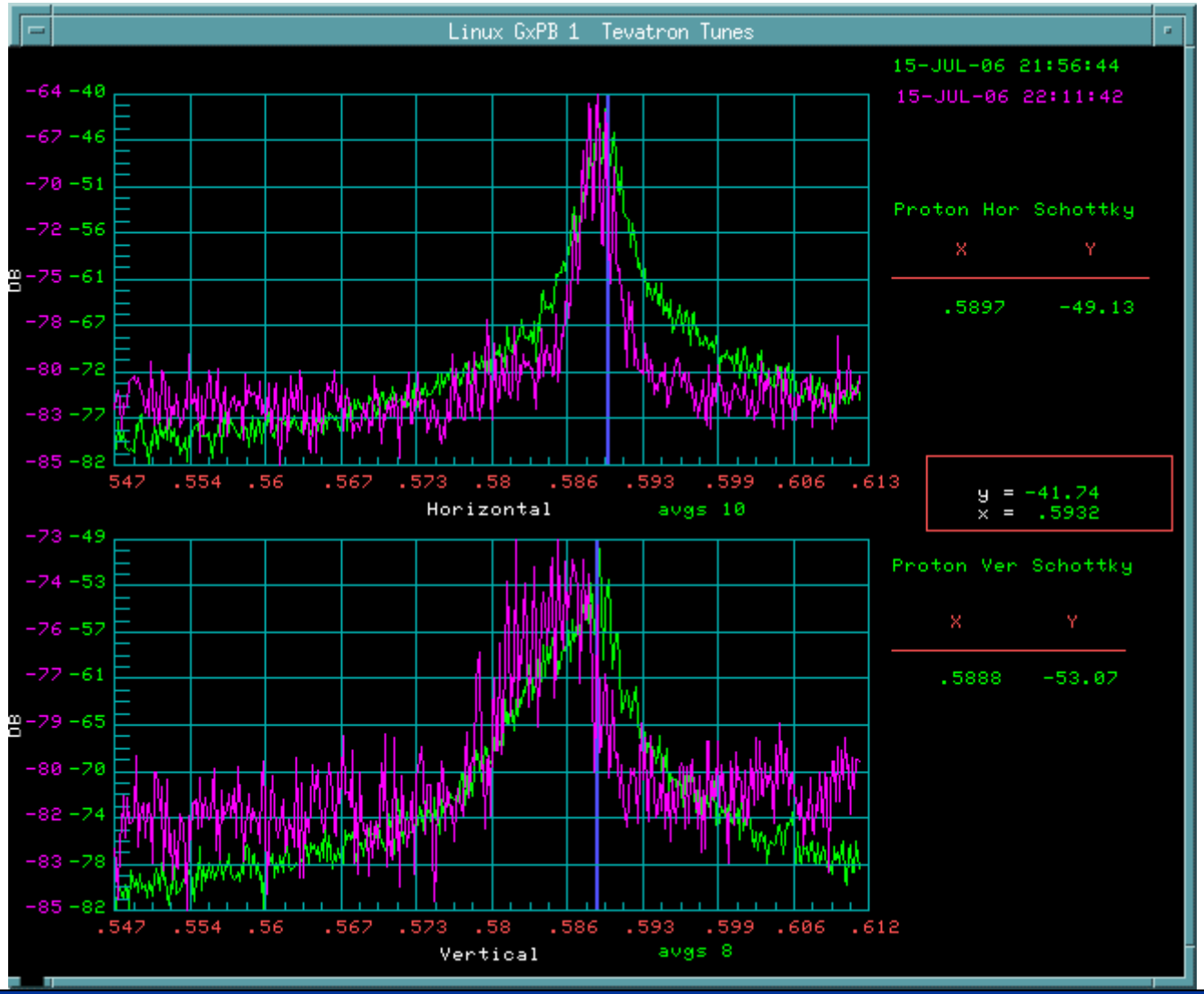
Ucath = -4 kV
Icath = Icol = 0-0.75 A

Beam scans, dc mode



Horizontal scan, vertical position is constant (read back noise).

First tune shift

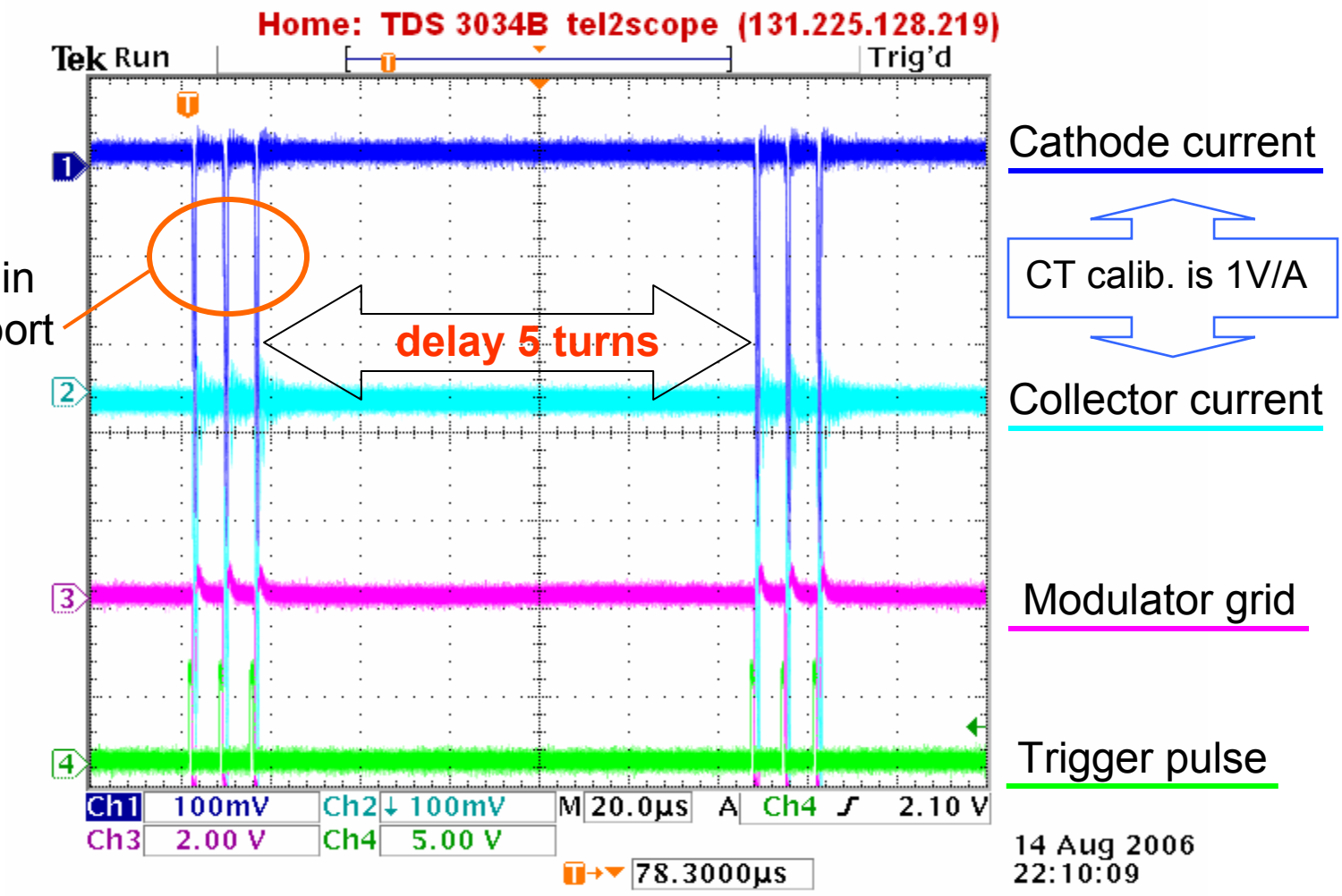


I_e = 0.5A
I_e = 0A

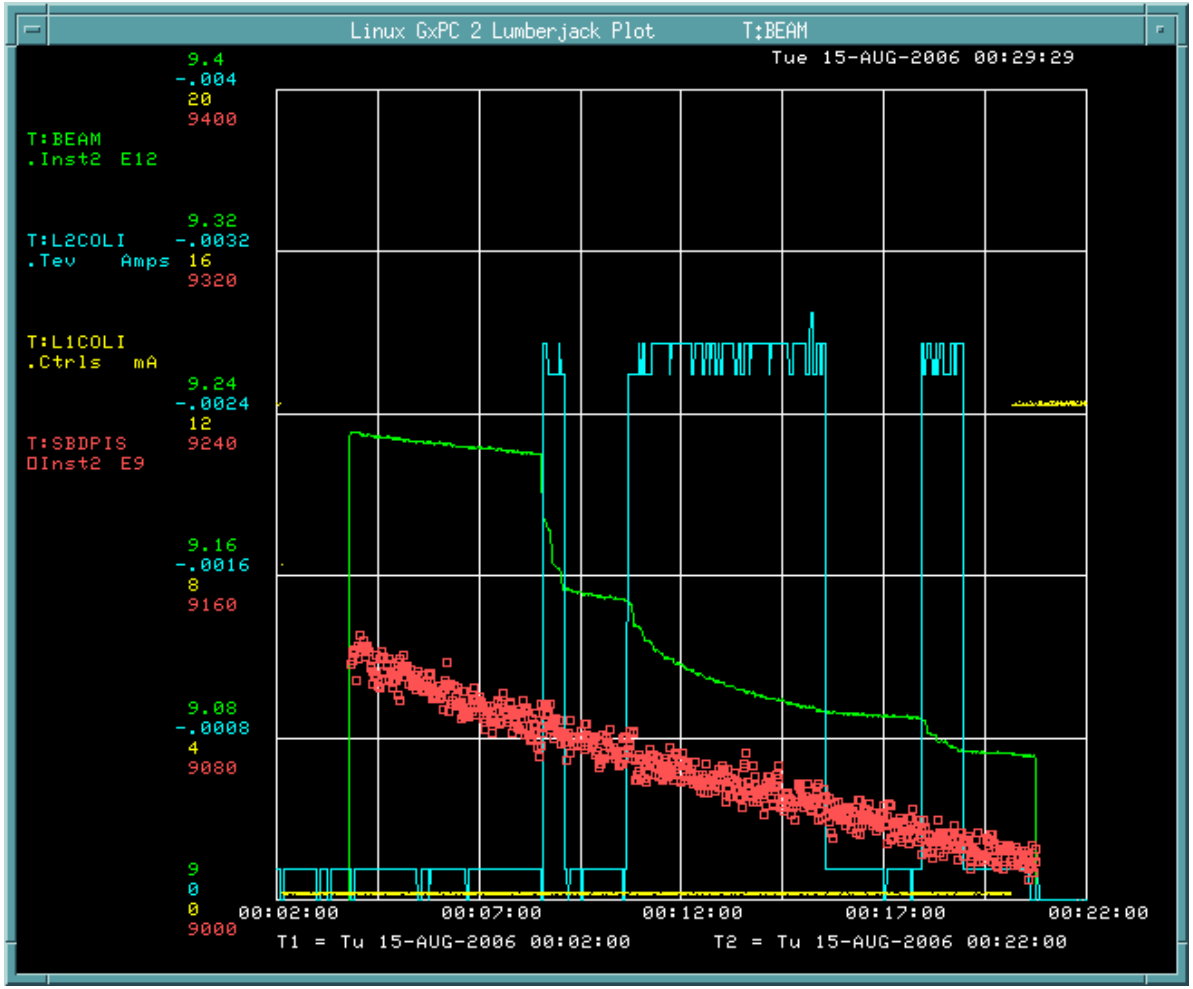
Vertical, as expected, tune shift of about 0.003

In this case the tune shift was accompanied by high proton losses, need better e-beam alignment

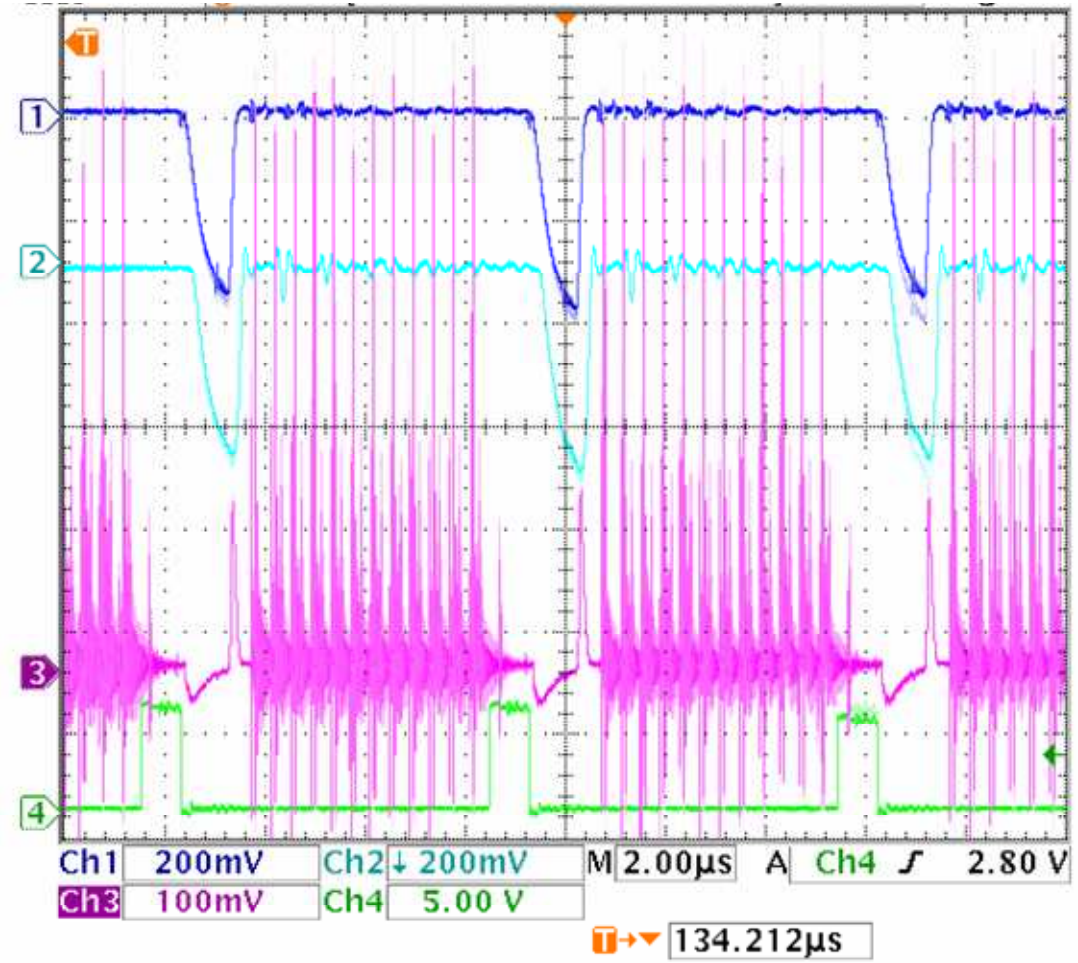
Timing the TEL for AGC



Abort gap cleaning at 150 GeV



Electron, p and pbar signals, EoS



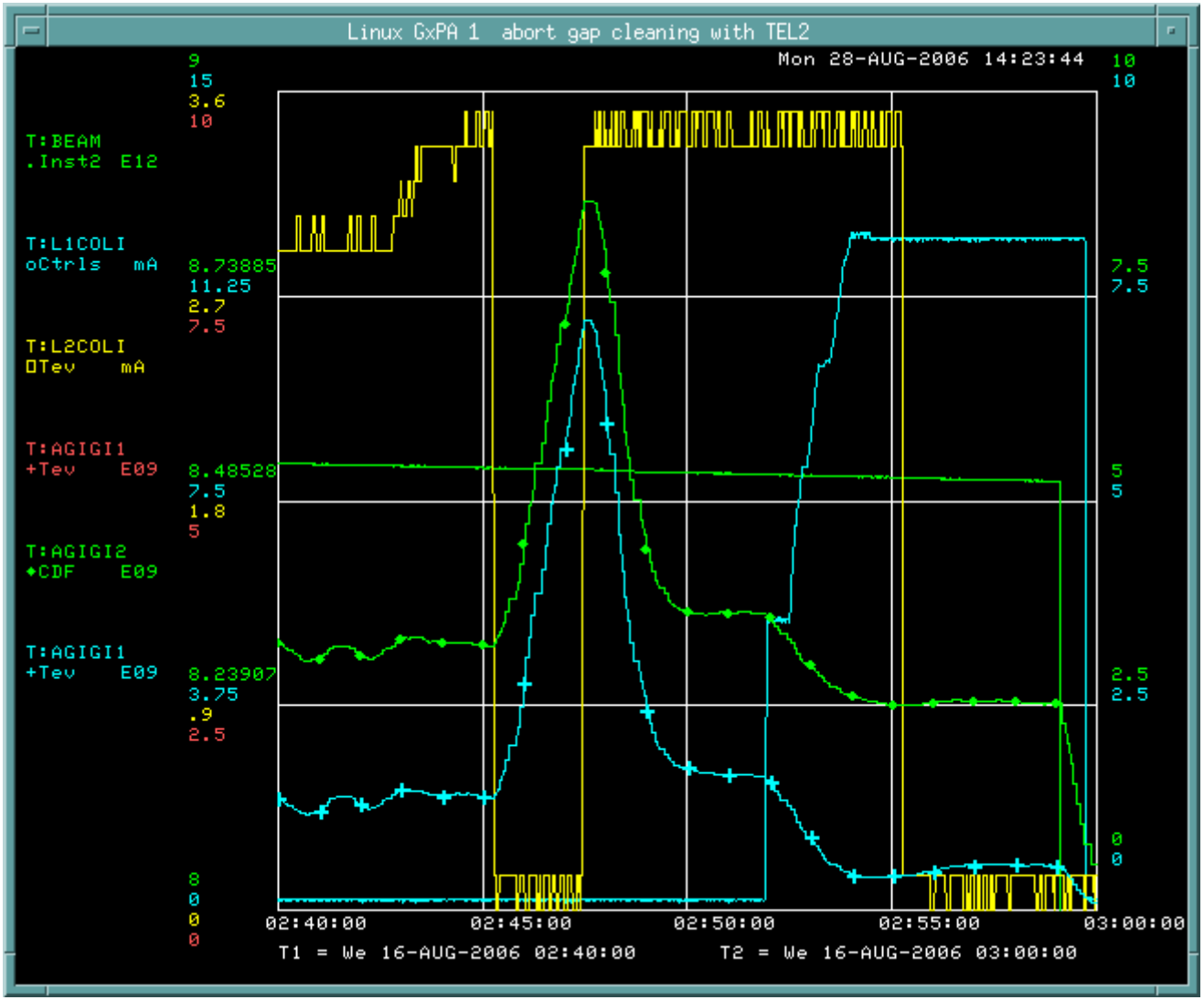
Cathode current

Collector current

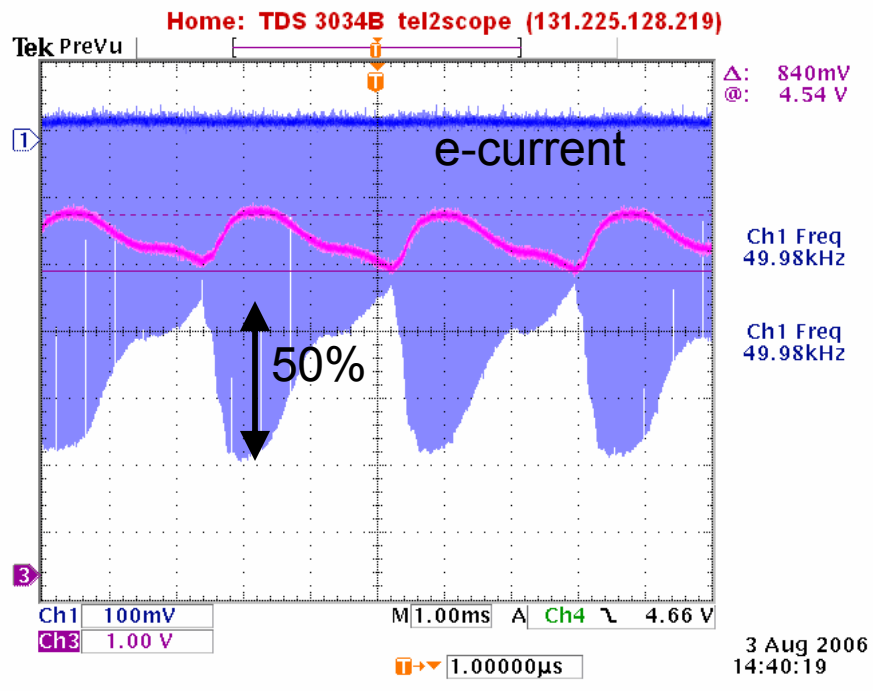
TEL2 BPM signal

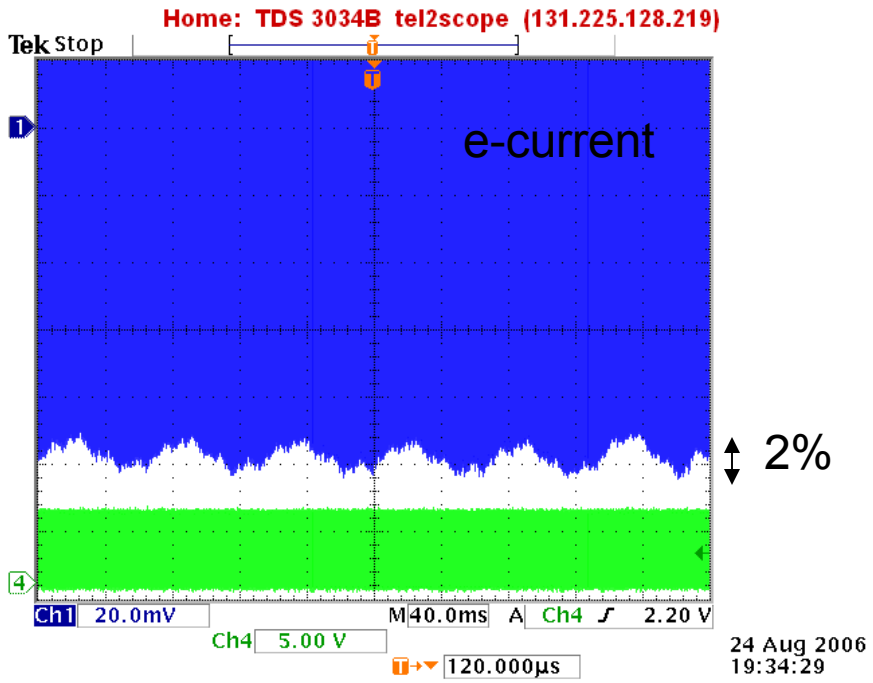
Trigger pulse

Abort gap cleaning at collisions



Fixing e-current ripple

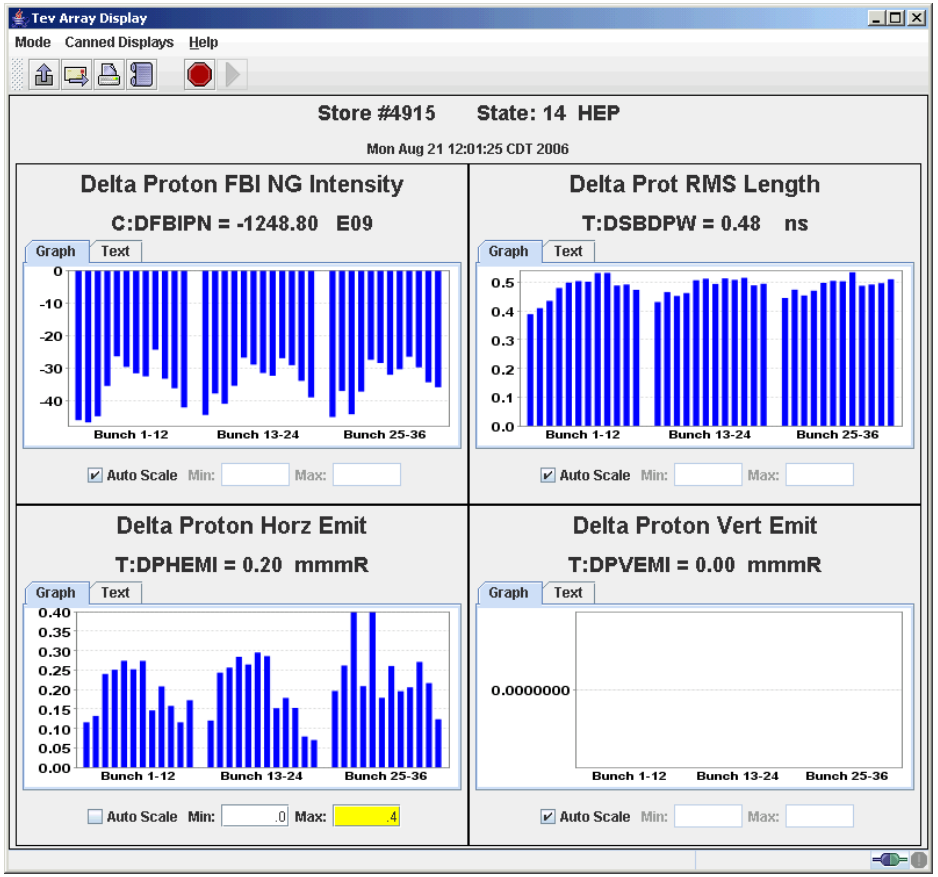




e-current stability has been improved (from 50% to 2%), thanks to EE-support

Study plan

We would like to routinely compensate one proton bunch over large number of stores (~10) to improve it's lifetime.



Summary and plans

- TEL2 can be used in pulsed and dc-regime
- Abort gap cleaning with TEL2 has been demonstrated both at injection and collisions
- Redesigned SEFT gun has been assembled and is currently being tested on the test bench
- Pulse to pulse e-beam stability is sufficient to proceed with Beam-Beam Compensation studies
- We would like to compensate one proton bunch routinely during 10 stores (after we have demonstrated there is no harm in an EoS study).

Thanks to:

- Mech. Support Dept.
- EE support Dept.
- Instrumentation Dept.
- Controls Dept.
- Everyone who helped to install and commission the TELs